(No Model.)

2 Sheets—Sheet 1.

S. E. HILDRETH.

UPRIGHT DRILL.

No. 426,588. Patented Apr. 29, 1890.

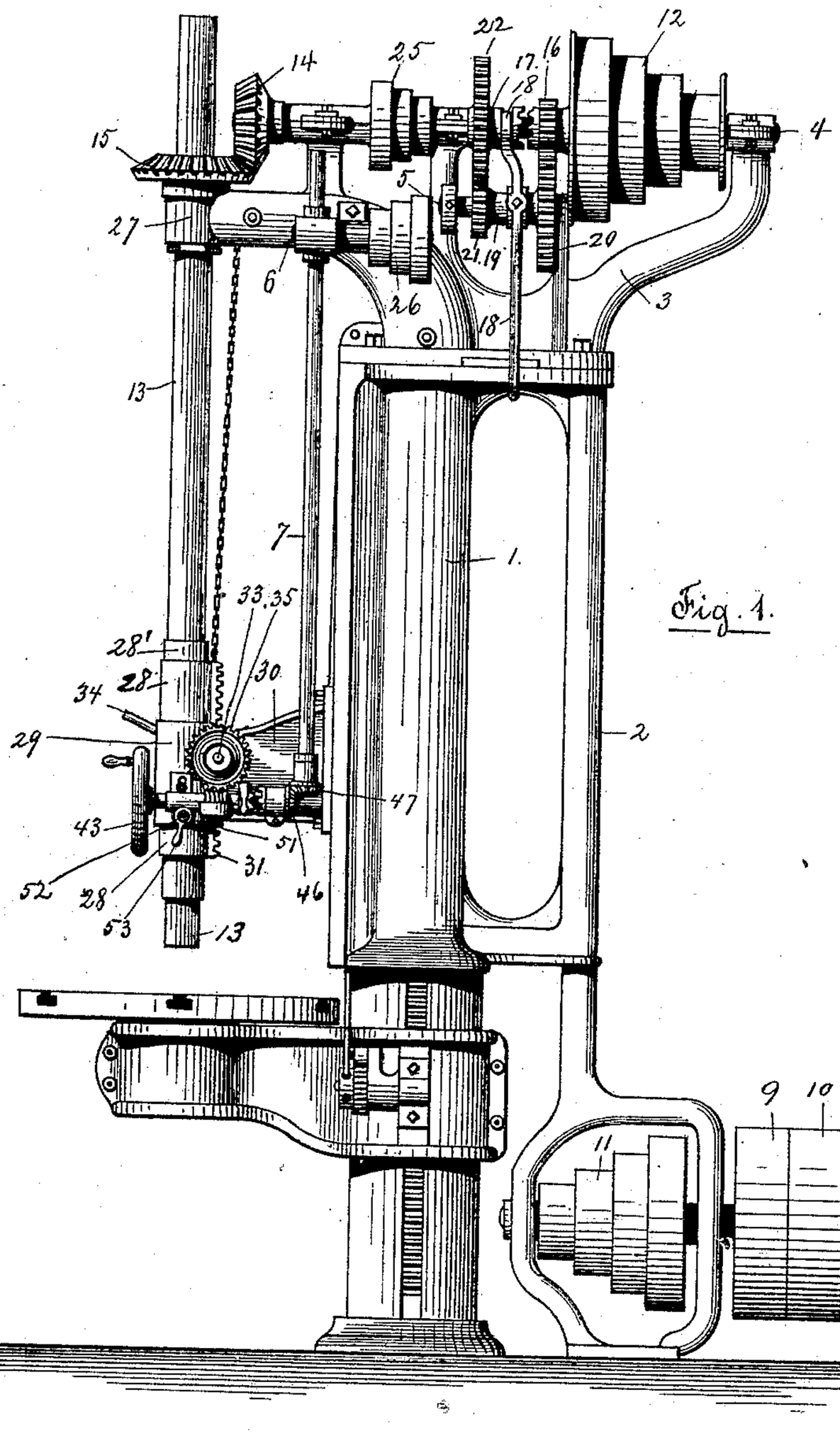

Fig. 1.

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(No Model.)

2 Sheets—Sheet 2.

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Fig. 2.

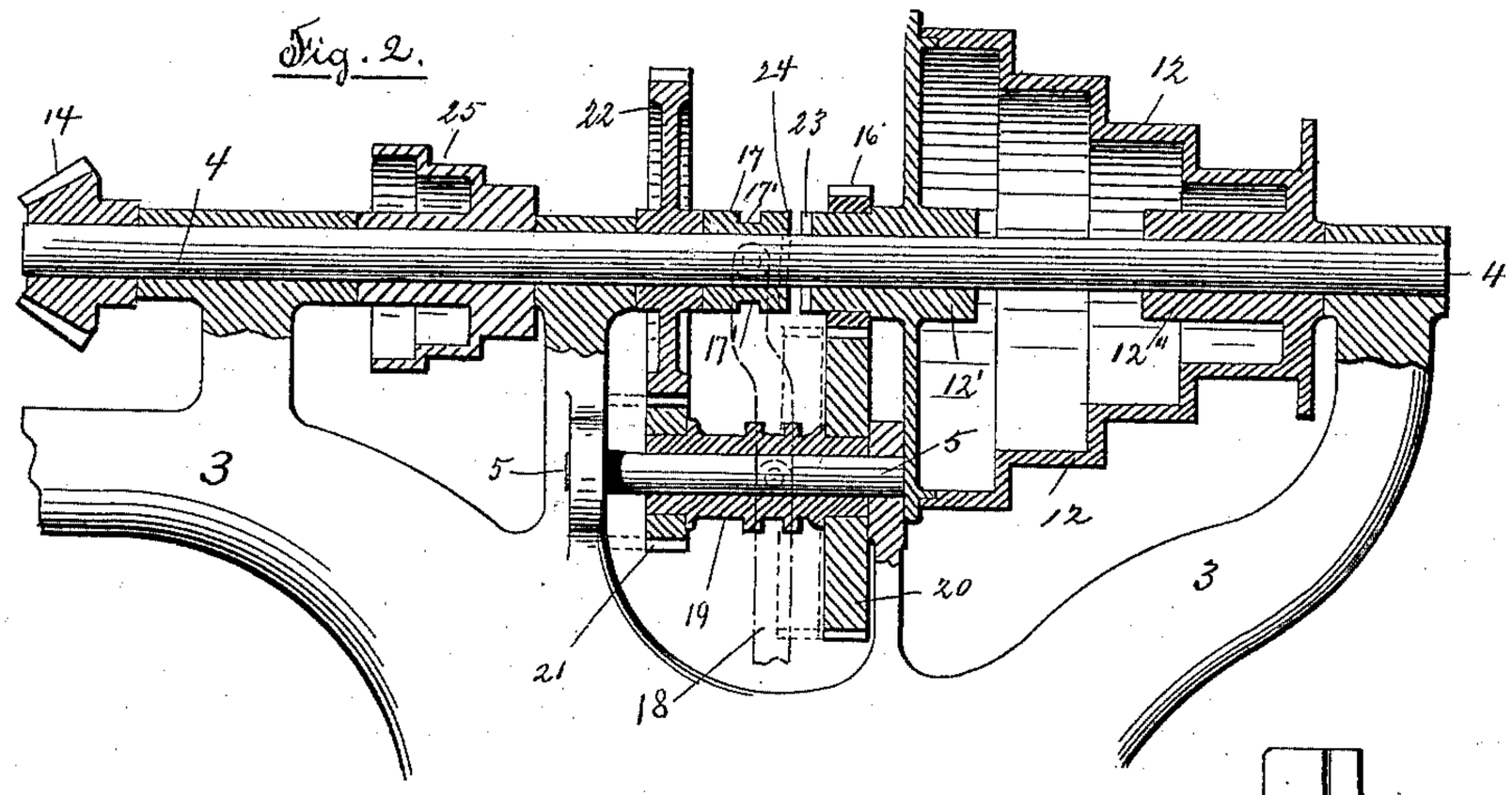


Fig. 3

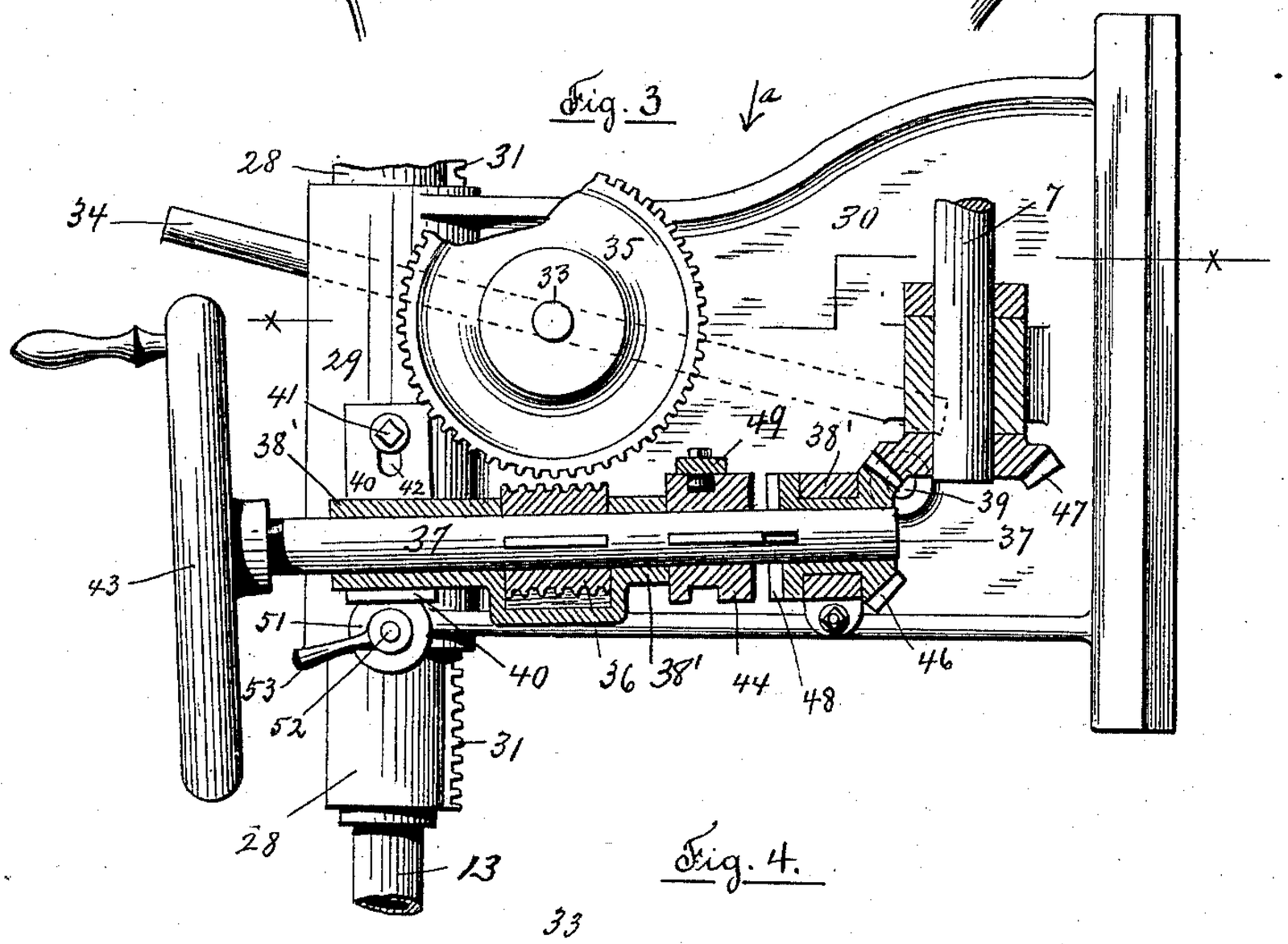
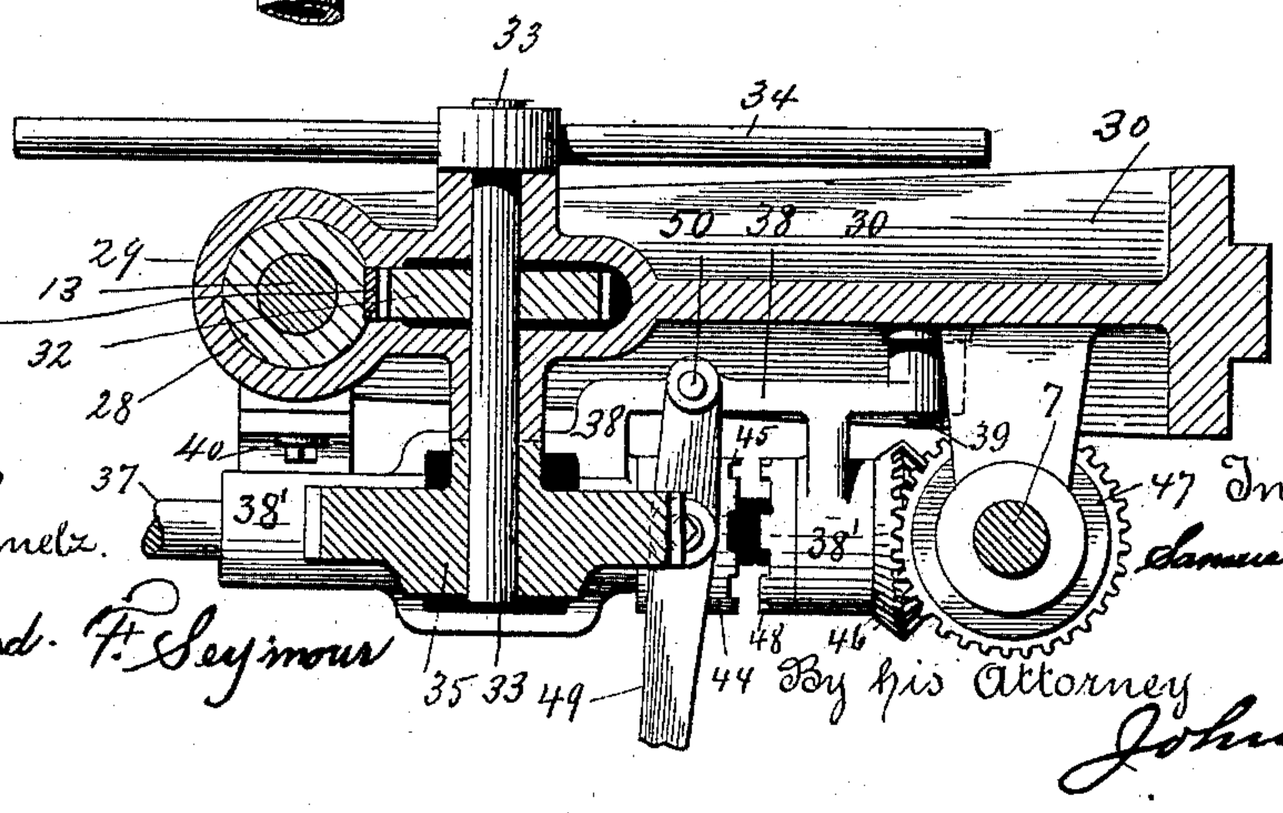


Fig. 4.



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UNITED STATES PATENT OFFICE.

SAMUEL E. HILDRETH, OF WORCESTER, MASSACHUSETTS, ASSIGNOR TO P. BLAISDELL & CO., OF SAME PLACE.

UPRIGHT DRILL.

SPECIFICATION forming part of Letters Patent No. 426,588, dated April 29, 1890.

Application filed January 6, 1890. Serial No. 335,983. (No model.)

To all whom it may concern:

Be it known that I, SAMUEL E. HILDRETH, a citizen of the United States, residing at Worcester, in the county of Worcester and State of Massachusetts, have invented certain new and useful Improvements in Upright Drills; and I do hereby declare that the following is a full, clear, and exact description thereof, which, in connection with the drawings making a part of this specification, will enable others skilled in the art to which my invention belongs to make and use the same.

My invention relates to upright power-drills or drilling-machines; and the object of my invention is to improve upon and simplify the construction and operation of upright drills as now ordinarily manufactured.

My invention consists in certain novel features of construction and operation of certain parts of an upright drill, and more particularly of the back-gearing-driving mechanism and means for connecting and disconnecting the same, and of the mechanism for connecting and disconnecting the power-feed and the reduced hand-feed of the drill-spindle, all as will be hereinafter fully described, and the nature thereof indicated by the claims.

Referring to the drawings, Figure 1 is a side elevation of an upright drill with my improvements applied thereto. Fig. 2 represents, on an enlarged scale, a detached sectional view of the upper part of the drill. Fig. 3 represents, on an enlarged scale, a detached detail, partially in section, of my improved mechanism for disconnecting the power-feed and reduced hand-feed of the drill-spindle; and Fig. 4 is a cross-section on line *x x*, Fig. 3, looking in the direction of arrow *a*, same figure.

I have shown in the drawings an upright power-drill or drilling-machine of ordinary construction and operation with my improvements applied thereto.

In the accompanying drawings, 1 is the main part of the frame of the machine or the upright column, of ordinary construction, and 2 a supplemental frame or support made integral with the column 1 or attached thereto. Upon the upper ends of column 1 and frame 2 is supported and secured, by bolts or otherwise, a stand or frame 3, on which are mounted in suitable bearings the cone-shaft 4, the back gearing-shaft 5, and the cone-shaft 6 for operating the power-feed shaft 7 of the drill in the ordinary way. In the lower part of the frame 2 is supported the counter-shaft 8, carrying the fast and loose pulleys 9 and 10, and the lower driving-cone 11, fast on said shaft 8. A belt (not shown) connects the lower driving-cone 11 with the upper driving-cone 12, loose on shaft 4 in the ordinary way, to communicate power from the counter-shaft 8 to the drill-spindle 13 through the cone-shaft 4, carrying the beveled gear 14, fast thereon, which meshes with the beveled gear 15, splined on drill-spindle 13 in the ordinary way.

I will now describe my improvements relating to the back gearing adapted to drive the cone-shaft 4, when desired, and the means for connecting and disconnecting the same to vary the speed of revolution of the drill-spindle. The cone-shaft 4, as before stated, has mounted loose thereon the driving-cone 12. Said cone 12 is provided with hubs 12′ 12″, through which cone-shaft 4 passes. (See Fig. 2.) The inner hub 12′ has its outer face provided with clutch-teeth 23, (see Figs. 1 and 2,) to form one member of a clutch; also mounted on the hub 12′ is a small gear 16, fast thereon. A collar 17, having its outer face provided with clutch-teeth 24 to correspond with clutch-teeth 23 on the hub 12′ and forming the other member of the clutch, is mounted on shaft 4, so as to slide longitudinally thereon, but prevented from turning thereon by a spline or feather, and said collar 17 has a circumferential groove 17′ therein, into which extends the upper forked end of the shipper-lever 18, said collar 17 acting as a fulcrum for the shipper-lever 18 during a portion of its shipping motion. The shipper-lever 18 is made in one piece and has its upper end forked, as above described, to engage with the sliding collar 17 on the upper driving-shaft 11. Below the forked end the lever 18 is provided with a curve projection or hook extending out from the inner side thereof to engage with and extend into a groove in the sliding sleeve 19 (see Fig. 2) in such a manner as not to interfere with the revolution of said sleeve upon its supporting-shaft 5, (which in this instance is made stationary,) or with the sliding of

said sleeve 19 on said shaft. It will thus be seen that the shipper-lever 18 does not have a single fulcrum-point upon which it is moved back and forth to ship and unship the gearing mechanism, as is customary in ordinary shipping-levers; but said shipper-lever 18 has two fulcrum-points, the lower one which acts as a support for said lever on the sleeve 19 and the upper one on the clutch-collar member 17. By this construction I simplify very much the construction and operation of the shipper-lever 18 for connecting and disconnecting the back gears. I also do away with the necessity of any intermediate bracket or stand upon which to support the shipper-lever 18 between the upper shaft 4 and the lower shaft 5.

It will be readily understood by those skilled in the art that in operating the shipper-lever 18 during a certain portion of its shipping motion the forked end will act as a fulcrum for the rest of the lever, and also during a certain portion of its shipping motion the point of connection of the lever with the sleeve 19 will act as a fulcrum for the rest of the lever.

Fast on one end of the sleeve 19 is a large gear 20, which meshes with the small gear 16 when the back gearing is in operation, as shown in Figs. 1 and 2, to reduce the speed of revolution of the drill 13. Fast on the other end of sleeve 19 is a small gear 21, which meshes with the large gear 22, fast on the cone-shaft 4.

The manner of operation of the mechanism above described for connecting and disconnecting the back gearing to vary the speed of revolution of the drill-spindle will be readily understood by those skilled in the art from the above description in connection with the drawings.

In the drawings, Figs. 1 and 2, the back gears are shown connected or in engagement adapted to drive the cone-shaft 4, and thus reduce the speed of revolution of the drill-spindle, power being transmitted from the upper driving-cone 12, loose on the cone-shaft 4, and small gear 16, large gear 20, small gear 21, and large gear 22, fast on the cone-shaft 4, and the beveled gear 14, also fast on said shaft 4, to the beveled gear 15, splined on the drill-spindle.

When it is desired to disconnect the back gears, so as to increase the speed of revolution of the drill-spindle and drive the cone-shaft 4 directly from the cone 12 without employing the system of gears above described, the shipper-lever 18, fulcrumed on the sleeve 19 and also on the clutch-collar 17, as before described, is drawn over to the left, causing the upper forked end engaging the sliding collar 17 of the clutch to move toward the right and strike against the clutch-teeth 23 of the hub 12′ of the cone 12, which acts as a stop against which the lower end of the lever 18 is drawn over still farther toward the left, the forked end of the lever acting as a fulcrum until the sleeve 19 on the shaft 5 is moved along so as to disconnect the large gear 20 and small gear 21 from the small gear 16 and large gear 22, respectively, as shown in dotted lines, Fig. 2.

The continued revolution of the driving-cone 12 causes the clutch-teeth 23 on the face of the hub 12′ to engage with the clutch-teeth 24 on the collar 17 and clutch the collar 17 with the hub 12′ of the driving-cone 12, thus causing the driving-cone 12 to revolve with the cone-shaft 4.

By the return movement of the shipper-lever 18 the clutch-teeth 23 and 24 are disconnected, and the hub of the large gear 22 acts as a stop against which the lower end of the shipper-lever 18 operates to draw over the sleeve 19, carrying the small gear 21 and large gear 20, and cause the same to engage and mesh with the large gear 22 and small gear 16, as shown in Figs. 1 and 2 of the drawings. It will thus be seen that without stopping the machine, and by simply moving over the lower end of the shipper-lever 18, I am enabled to connect or disconnect the back gearing and throw the same into or out of operation and to clutch or unclutch the driving-cone on the cone-shaft, all as will be readily understood by those skilled in the art.

I will now proceed to describe my improved mechanism for connecting and disconnecting the power-feed and the reduced hand-feed to and from the drill-spindle, so as to allow the quick return or the quick hand-feed of the same. The power-feed shaft 7 is operated in the ordinary way by a belt (not shown) passing from the cone 25, fast on the cone-shaft 4, to the cone 26, fast on the cone-shaft 6, through a pinion fast on said shaft 6, and a worm splined on the shaft 7 (not shown) in the usual way. The drill-spindle 13 revolves in a bearing 27 at its upper end, and is splined to the beveled gear 15, which rests on said bearing, and said spindle is supported at its lower end, by means of a collar 28′, in a sleeve 28, which is formed to fit in a bearing 29 upon a bracket 30, movably held at its inner end in a groove upon the front of the column 1, all as is customary in other machines. A toothed rack 31 is formed integral on the inner side of the sleeve 28, and is operated by the worm-gearing usually employed to reduce the quick movement of the power-feed shaft 7 to the proper speed for the pinion 32, which operates the rack 31. (See Fig. 4.) It will be understood that the drill-spindle 13 revolves within and moves up and down with the sleeve 28 by means of the collar 28′ as said sleeve is raised and lowered by means of the rack 31 and pinion 32, meshing therewith, fast on the shaft 33, which has its bearing on the bracket 30 and carries on one end the hand-bar 34, Fig. 4, and on the other end the worm-gear 35, which meshes with the worm 36, fast on the shaft 37, which is arranged below the worm-gear 35. The shaft 37, carrying the worm 36, is supported in bearings 38′ on the frame 38, hinged

at its inner end on a pin 39, secured on the bracket 30. (See Figs. 3 and 4.)

The outer end of the frame 38 is attached, by means of a slotted bar 40 and a bolt 41, extending through the slot 42 in said bar, to the bearing 29 at the outer end of the bracket 30. The shaft 37, supported and revolving in bearings 38′ on the frame 38, carries at its outer end a hand-wheel 43, fast thereon, the worm 36, fast thereon, the sliding collar 44, splined thereon and provided with clutch-teeth 45 on the outer face thereof, and the beveled gear 46, loose on the inner end thereof and meshing with the beveled gear 47, fast on the lower end of the feed-shaft 7.

The hub of the beveled gear 46 is provided with clutch-teeth 48, adapted to engage with the clutch-teeth 45 of the sliding collar 44. The clutch-teeth 45 and 48 are connected and disconnected by means of a lever 49, pivoted at 50 upon the frame 38, and with its front end preferably bent downward, as shown in Fig. 1.

By moving the lever 49 to the right the clutch-teeth 45 of the sliding collar 44 will engage the clutch-teeth 48 of the beveled gear 46 and cause the beveled gear 46, loose on the shaft 37, to revolve with said shaft and transmit to the drill-spindle 13 the power-feed from the power-feed shaft 7. By moving the lever 49 to the left the collar 44 will slide on the shaft 37 and the clutch-teeth 45 thereof be disconnected from the clutch-teeth 48 of the beveled gear 46, as shown in the drawings, allowing the beveled gear 46 to turn loosely on the shaft 37, and thus disconnect the power-feed.

By means of the hand-wheel 43, fast on the shaft 37, motion is communicated to the drill-spindle 13 through the worm 36, worm-gear 35, pinion 32, and rack 31 on sleeve 28 in the usual manner. When it is desired to disconnect the reduced movement of the power and hand feed of the drill-spindle, the hinged frame 38 is dropped down at its front end by means of a cam 51, fast on a pin 52, secured in the bearings 29 and operated by a hand-lever 53, the flat portion of the cam coming under the lower end of slotted bar 40 on the front of the frame 38 and allowing said frame 38, carrying the shaft 37 and parts supported thereon, to drop down at its front end, and thus disconnect the worm 36 from the worm-gear 35 without disconnecting the beveled gears 46 and 47.

When the frame 38 is dropped down, as shown in Fig. 3, the quick movement or the quick feed or quick return of the drill-spindle may be obtained by means of the hand-bar 34. After the hand-bar 34 has been operated the reduced movement may be again imparted to the drill-spindle by simply moving the cam-handle 53 into the position shown in Fig. 1, causing the frame 38 to be thrown up into a horizontal position and the worm 36 to again engage the worm-gear 35.

It will thus be seen that by hinging the frame 38 at its inner end on a pin 39 at or near the center line of mesh of the teeth on the beveled gears 46 and 47 (see Fig. 3) I am enabled to disconnect the worm 36 from the worm-gear 35 without disconnecting the beveled gears 46 and 47, and thus no time is lost in applying the power-feed from the feed-shaft 7 when desired.

I am aware that prior to my invention the shaft carrying the hand-wheel and the worm which meshes with the worm-gear of the hand feed mechanism has been supported on a frame hinged at its inner end, so that the worm and worm-gear may be disconnected by dropping the hinged frame at its front end, as shown in Patent No. 135,313. I therefore do not claim, broadly, the shaft-supporting frame hinged at its inner end, but simply the combination of the several mechanisms shown and described.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In an upright drill, the combination, with the drill-spindle, the cone-shaft geared thereto, a cone running loosely thereon provided with clutch-teeth, and a collar sliding on said shaft but prevented from turning thereon, and provided with clutch-teeth, for the purpose stated, of back gearing adapted to drive the cone-shaft when desired, and means for connecting and disconnecting the back gears and clutching and unclutching the driving-cone, consisting of a shipper-lever supported on a sleeve on the shaft of the lower set of back gears, the point of connection of said lever with said sleeve acting as a fulcrum for said lever during a portion of its movement, and also provided with a forked upper end for engagement with the sliding clutch-collar on the cone-shaft, the point of connection of said forked end with said clutch-collar acting as a fulcrum for said lever during a portion of its movement, substantially as set forth.

2. In an upright drill, the combination, with the shaft 11, the cone-pulley 12, loose on said shaft and provided with a pinion 16 and clutch-teeth 23, the gear 22, fast on said shaft, and a clutch-collar 17 on said shaft, of the shaft 5, carrying the sleeve 19, having the gears 20 and 21 thereon, and a shipper-lever 18, made in one piece and supported on and connected with the sleeve 19 to move the same, and having its upper end forked and engaging the clutch-collar 17 to move the same without any intermediate fulcrum or supporting-point, substantially as set forth.

3. In an upright drill having a power-feed, the combination, with the vertical power-feed shaft 7, provided with a bevel-gear 47 on its lower end, of the horizontal shaft 37, carrying a hand-wheel 34, a worm 36, a sliding clutch-collar 44, and bevel-gear 46, provided with clutch-teeth and meshing with the bevel-gear 47, and a frame 38, carrying the shaft 37, hinged at its inner end at a point on or near

the center line of contact of the teeth of the bevel-gears 46 and 47, so that the front end of said frame may be lowered to disconnect the worm 36 from its worm-gear without disconnecting the teeth of the bevel-gears 46 and 47, and means for lowering the front end of said frame 38, substantially as set forth.

4. In an upright drill, the combination, with the movable spindle-bracket and a frame hinged at its inner end thereon, and means for raising and lowering said frame at its front end, of a shaft supported in bearings on said hinged frame and having a hand-wheel on its front end, a beveled gear loose on its inner end adapted to mesh with the beveled gear on the lower end of the power-feed shaft and provided with clutch-teeth adapted to engage with and clutch a collar sliding on said shaft, also provided with clutch-teeth, and said collar operated by a hand-lever, and a worm fast on said shaft for driving the worm-gear of the mechanism for raising and lowering the drill-spindle at reduced speed, substantially as set forth.

5. In an upright power-feed drill, the combination, with bracket 30, frame 38, hinged at its inner end on said bracket and supported by a slotted bar at its outer end, and a cam 51, for raising and lowering the outer end of said frame, of a shaft supported in bearings on said frame and movable up and down therewith, a hand wheel or bar on the outer end of said shaft, a beveled gear 46, provided with clutch-teeth 48, loose on the inner end of said shaft, a sliding clutch-collar 44, a hand-lever for sliding the same and a worm 36 on said shaft intermediate the hand-wheel and beveled gear 46, said worm 36 adapted to mesh with the gear of the drill-spindle raising and lowering mechanism and to be disconnected therefrom without disconnecting the beveled gear 46, substantially as set forth.

6. In an upright power-feed drill, the combination, with shaft 37, carrying hand-wheel 43, worm 36, sliding clutch-collar 44, and beveled gear 46, provided with clutch-teeth 48, of the frame 38, supporting the shaft 37 and hinged at its inner end and adapted to be raised and lowered at its outer end for the purpose stated, and means for raising and lowering the same, substantially as set forth.

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Witnesses:
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